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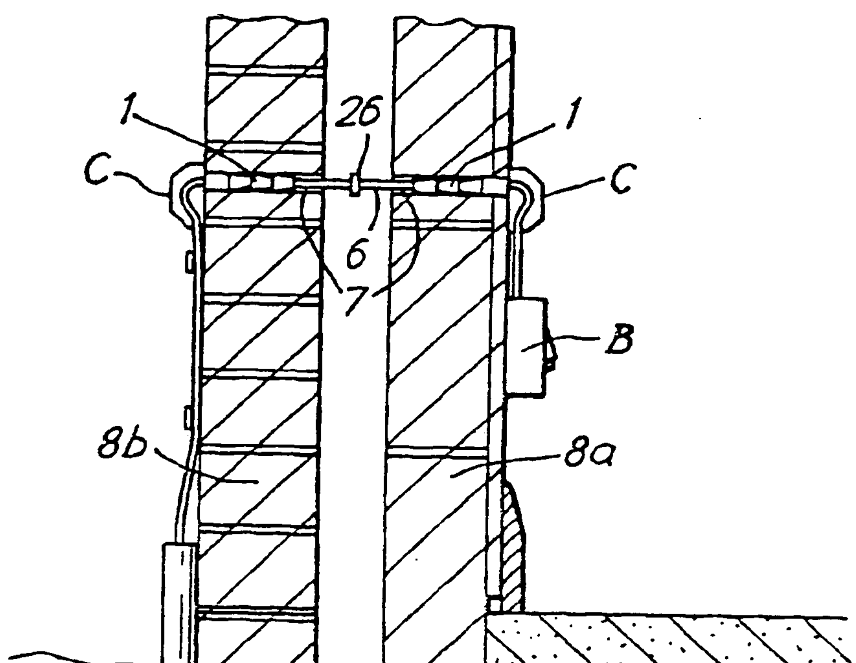
(57) Abstract

A customer lead in unit (C) guides an optical fibre transmission line through an aperture (7) in the wall (8a, 8b) of a customer's premises. The unit (C) comprises a hollow wall plug (1) which is frictionally engageable within the aperture (7), and a pair of complementary bend control pieces (2), each having a bend control surface (2a) formed with a curved bend control groove (4) whose curvature conforms with minimum bend radius requirements for the optical fibre transmission line. The bend control pieces (2) are formed with engagement portions (3) which inter-engage with a complementary engagement portion (1a) formed at one end of the wall plug (1) to grip the wall plug between the two bend control pieces. The bend control grooves (4) are positioned so as to define a bend control channel that is contiguous with the hollow interior of the wall plug (1) when the wall plug is gripped by the two bend control pieces (2).



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OPTICAL FIBRE CUSTOMER LEAD IN

This invention relates to optical fibre customer lead in (CLI), that is to say to the way in which optical fibres (such as telecommunications optical fibres) are led into customers' premises.

In the United Kingdom, the telecommunications network includes a trunk network which is substantially completely constituted by optical fibre, and a local access network which is substantially completely constituted by copper pairs. Eventually, it is expected that the entire network, including the access network, will be constituted by fibre.

The ultimate goal is a fixed, resilient, transparent telecommunications infrastructure for the optical access network, with capacity for all foreseeable service requirements. One way of achieving this would be to create a fully-managed fibre network in the form of a thin, widespread overlay for the whole access topography, as this would exploit the existing valuable access network infrastructure. Such a network could be equipped as needs arise, and thereby could result in capital expenditure savings, since the major part of the investment will be the provision of terminal equipment on a 'just in time' basis. It should also enable the rapid provision of extra lines to new or existing customers, and flexible provision or reconfiguration of telephony services.

In order to be completely future proof, the network should be single mode optical fibre, with no bandwidth limiting active electronics within the infrastructure. Consequently, only passive optical networks (PONs) which can offer this total transparency and complete freedom for upgrade, should be considered.

In a PON, a single optical fibre is fed out from the exchange head-end (HE), this fibre being fanned out via passive optical splitters at cabinets and distribution points (DPs) to feed optical network units (ONUs). The ONUs can be in customers' premises, or in the street serving a number of

customers. The use of optical splitters enables sharing of feeder fibre and exchange based optical line termination (OLT) equipment, thereby giving PONs a cost advantage. In the United Kingdom, simplex PONs are planned, so that each customer is serviced by a pair of optical fibres.

In order to achieve the goal of providing a fixed, resilient, transparent telecommunications optical fibre access network, it will be important to minimise the installation costs at each part of the network. The present invention is concerned with minimising the cost of installation of fibre from a customer's premises to the nearest network node, and in particular to a cost-effective way of getting fibre into a customer's premises. In this connection, it should be noted that the preferred way of installing fibre is by the well known fibre blowing process (see EP 108590). In this process, a fibre unit (usually a two-fibre unit for residential premises) is blown through a small diameter (5mm) polyethylene tube.

The main problem to be overcome in feeding such a tube into a customer's premises arises from the fact that the tube must be fed along the outer wall of the premises and then turned through 90°, so as to pass through a hole formed in the wall. It must then be turned through 90° so that it can be fed along the inner wall of the premises. In each case, the turning must be accomplished without giving rise to optical loss in the blown-in fibre when it is live.

A known CLI apparatus is constituted by a pair of CLI units, one for fixing to the external surface of a customer's premises wall and one for fixing to the internal surface of that wall. Each of these units is fairly large, as it accommodates a complete loop of tube (fibre), the loop having a radius greater than the minimum band radius (100mm) for this type of tube. The hole drilled through the wall between the two CLI units has a fairly large diameter so as to accommodate a bend limiting conduit through which the tube (fibre) passes between the two units. Not only are these CLI units relatively large and require the drilling of a

relatively large diameter hole, but they are also expensive and time-consuming to fit. Presently, they are used for business premises CLI, where their cost can be justified by the number of lines normally installed for such premises. For residential customers, however, which usually have only one line, these units are far too expensive. In this connection, it should be noted that there are 14 million residential premises in the United Kingdom.

The present invention provides a customer lead in unit for guiding an optical fibre transmission line through an aperture in the wall of a customer's premises, the unit comprising a hollow wall plug which is frictionally engageable within said aperture, and a pair of complementary bend control pieces, each bend control piece having a bend control surface formed with a curved bend control groove whose curvature conforms with minimum bend radius requirements for the optical fibre transmission line, the bend control pieces being formed with engagement portions which inter-engage with a complementary engagement portion formed at one end of the wall plug to grip the wall plug between the two bend control pieces, and the bend control grooves being positioned so as to define a bend control channel that is contiguous with the hollow interior of the wall plug when the wall plug is gripped by the two bend control pieces.

Conveniently, a flange formed at said one end of the wall plug constitutes the complementary engagement portion, and each of the bend control pieces is formed with a complementary groove formed in its bend control surface, said grooves constituting the engagement portions.

The invention further provides customer lead in apparatus for guiding an optical fibre transmission line through an aperture in the wall of a customer's premises, the apparatus comprising two customer lead in units each as defined above, one unit being positioned at the mouth of the aperture at the external surface of the wall, the other being positioned at the mouth of the aperture at the internal

surface of the wall.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a exploded perspective view of a wall plug and a bend control piece of a CLI unit constructed in accordance with the invention;

Figure 2 is a plan view of the CLI unit of Figure 1; and

Figure 3 is a cross-section taken through the cavity wall of a telecommunications network customer, and shows two CLI units of the type shown in Figures 1 and 2 in place to guide optical fibre into that customer's premise.

Referring to the drawings, Figures 1 and 2 show a CLI unit C constituted by an externally-fluted wall plug 1 and a pair of complementary bend control pieces 2. In use, the bend control pieces 2 fit together with complementary surfaces 2a thereof in engagement. The wall plug 1 and the two bend control pieces 2 are each moulded from an ultra violet (uv) stable plastics material such as polypropylene. One end of the wall plug 1 is formed with an annular flange 1a, this flange being a mating fit within complementary recesses 3 formed in the surfaces 2a of the bend control pieces 2. The wall plug 1 is formed with an axial bore 1b through which, in use, a tube containing optical fibre can pass. When the CLI unit C is assembled (with the flange 1a of the wall plug 1 positioned within the recesses 3 of the bend control pieces 2, and with the surfaces 2a in face-to-face engagement), the mouth of the bore 1b leads to a curved channel defined by a pair of complementary grooves 4 formed in the surfaces 2a. When in the assembled position, the CLI unit C can be fixed to the wall of a customer's premises by means of screws (not shown) passing through aligned apertures 5 pre-formed in the bend control pieces 2. The screws also act to fix the two bend control pieces 2 together around the flange 1a of the wall plug 1. When fixed to the wall, the engagement of the flange 1a within the recesses 3 holds the

wall plug 1 firmly with respect to the bend control pieces 2.

The grooves 4 are such as to curve through 90^0 with a radius of curvature which is 30mm (that is to say the minimum bend radius for the standard signal mode optical fibre normally used for telecommunications). The grooves 4 have a diameter of 5.2mm so as to accommodate the tubing 6 (see Figure 3) through which blown fibre is installed. The CLI unit C thus constitutes a simple device for guiding optical fibre through 90^0 without subjecting that fibre to bends which would cause a significant optical loss.

Figure 3 shows two CLI units C positioned on opposite sides of an external cavity wall of a customer's premises, the wall plugs 1 of the units frictionally fitting within 13mm bores 7 drilled in the inner and outer cavity wall portions 8a and 8b respectively. As shown in Figure 3, the blown fibre tubing 6 passes along the inside surface of the inner cavity wall portion 8a, through each of the CLI units C, and then along the outside surface of the outer cavity wall portion 8b. The tubing 6 can be fixed to the wall portions 8a and 8b by any suitable means.

CLAIMS

1. A customer lead in unit for guiding an optical fibre transmission line through an aperture in the wall of a customer's premises, the unit comprising a hollow wall plug which is frictionally engageable within said aperture, and a pair of complementary bend control pieces, each bend control piece having a bend control surface formed with a curved bend control groove whose curvature conforms with minimum bend radius requirements for the optical fibre transmission line, the bend control pieces being formed with engagement portions which inter-engage with a complementary engagement portion formed at one end of the wall plug to grip the wall plug between the two bend control pieces, and the bend control grooves being positioned so as to define a bend control channel that is contiguous with the hollow interior of the wall plug when the wall plug is gripped by the two bend control pieces.

2. A customer lead in unit as claimed in claim 1, wherein a flange formed at said one end of the wall plug constitutes the complementary engagement portion, and each of the bend control pieces is formed with a complementary groove formed in its bend control surface, said grooves constituting the engagement portions.

3. Customer lead in apparatus for guiding an optical fibre transmission line through an aperture in the wall of a customer's premises, the apparatus comprising two customer lead in units each as claimed in claim 1 or claim 2, one unit being positioned at the mouth of the aperture at the external surface of the wall, the other being positioned at the mouth of the aperture at the internal surface of the wall.

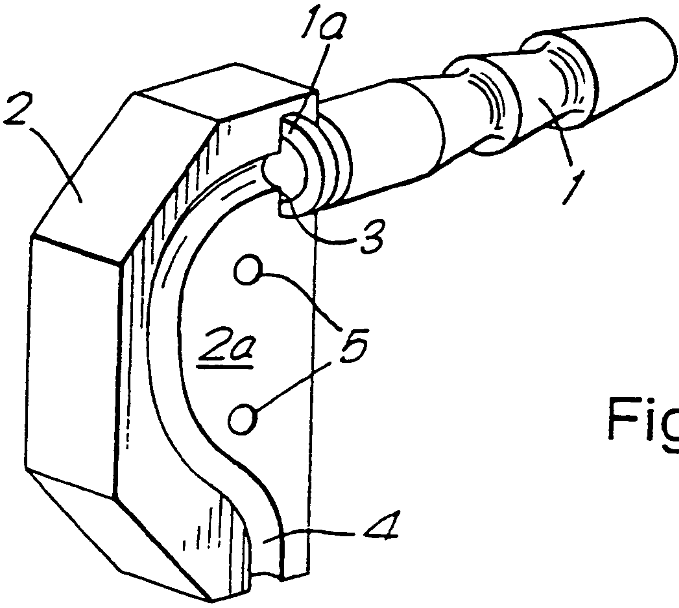


Fig.1

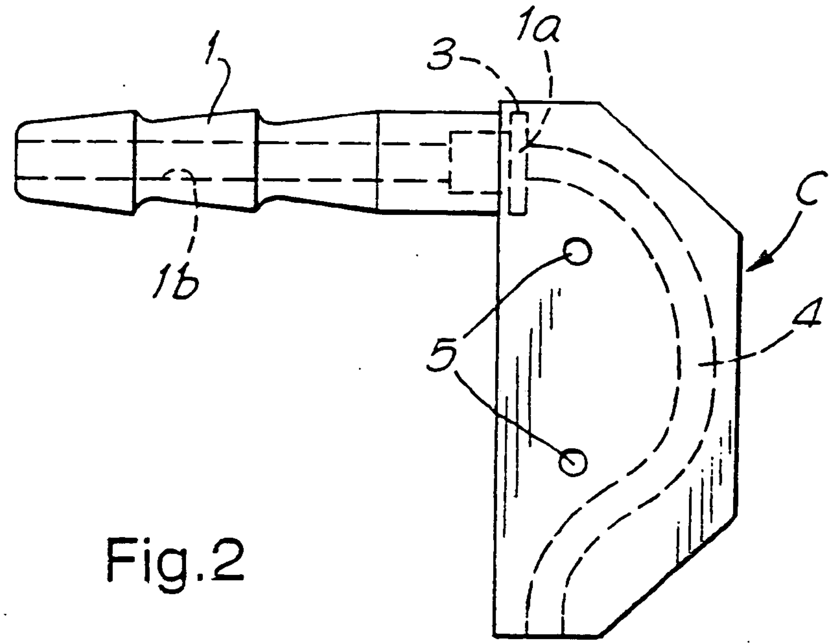
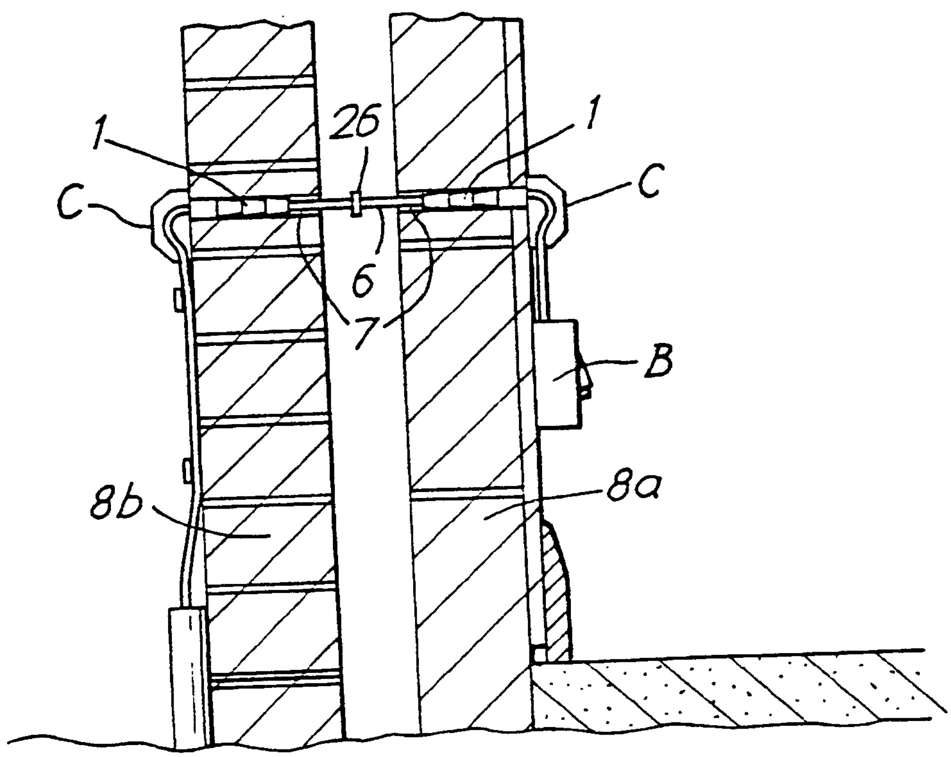


Fig.2

Fig.3.



INTERNATIONAL SEARCH REPORT

International Application No
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G02B H02G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,A,39 11 095 (LANCIER) 11 October 1990 see claims; figures ---	1-3
A	REVIEW ELECTRICAL COMMUNICATION LABORATORIES, vol.32, no.4, 1984, JP pages 636 - 645 S.KUKITA 'disign and performance of optical drop and indoor cable' ---	1-3
A	US,A,4 596 381 (J.C.HAMRICK) 24 June 1986 see claims; figures ---	1-3
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DE-A-3911095	11-10-90	NONE	
US-A-4596381	24-06-86	CA-A- 1156211	01-11-83
DE-U-9114452	19-03-92	NONE	

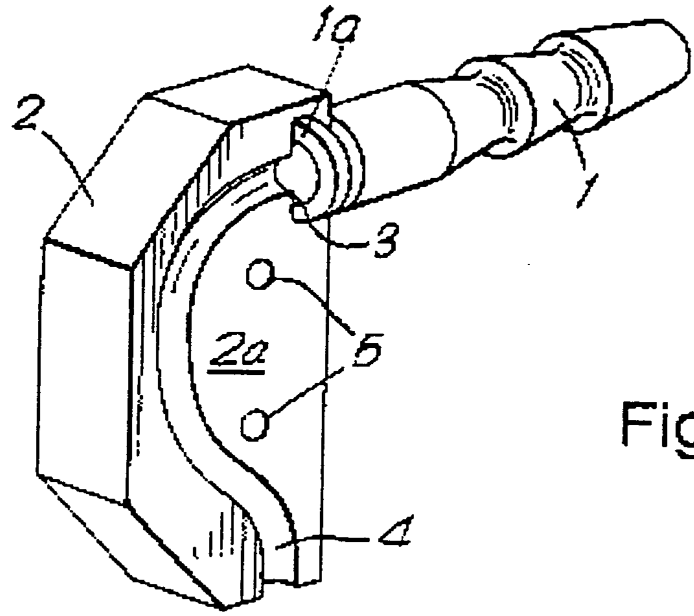


Fig.1

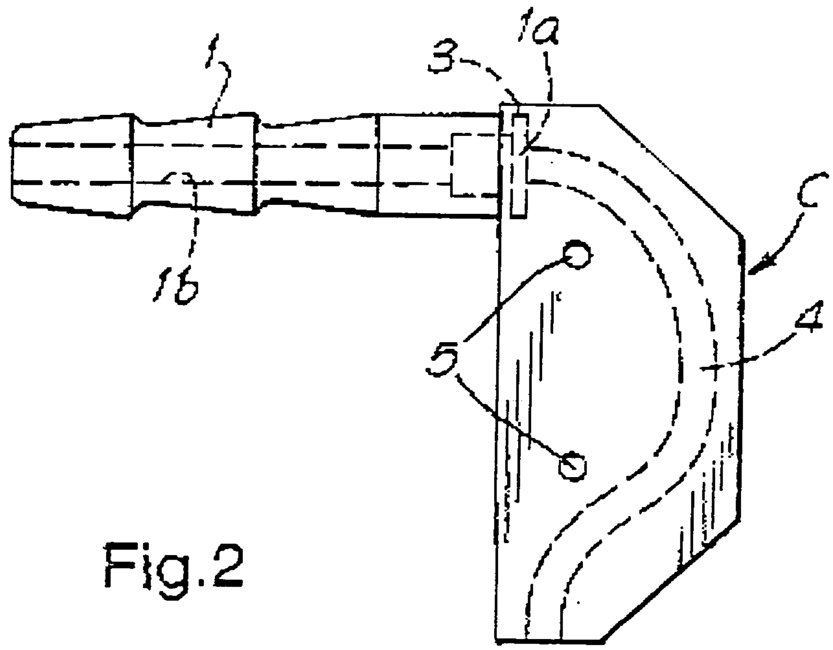
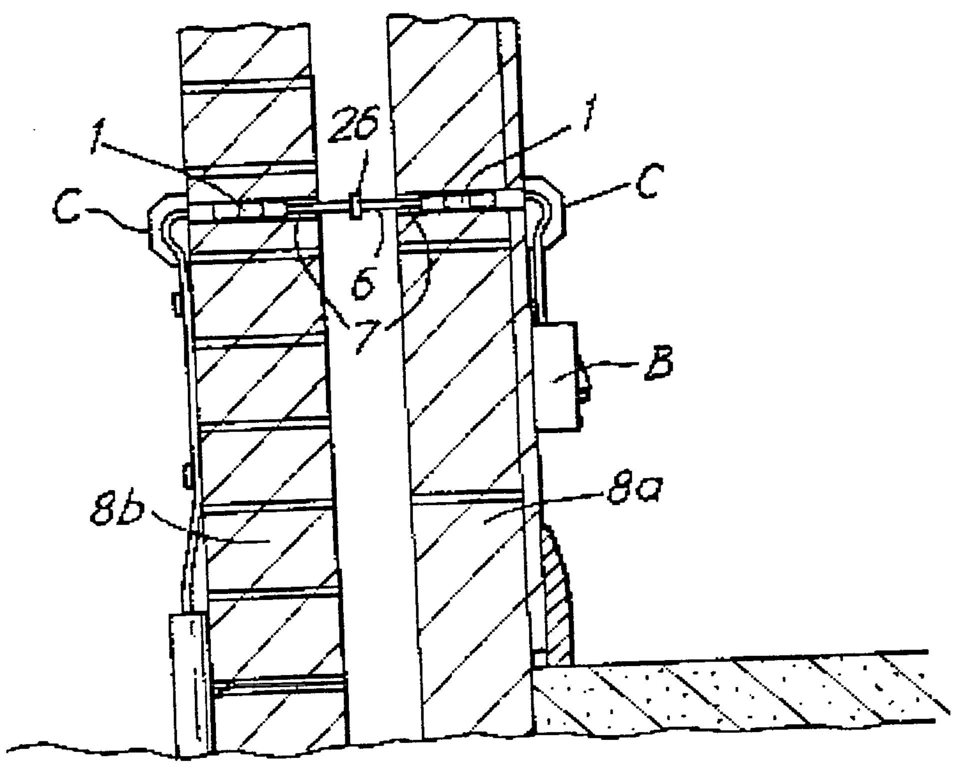


Fig.2

Fig.3.



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